

NOVELTIES IN SERPOCAULON (POLYPODIACEAE)

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ABSTRACT

We present five nomenclatural novelties in *Serpocaulon*: **S. articulatum** (C. Presl) Schwartzb. & A.R. Sm., the correct name for the specimens long called as *S. giganteum* (or *Polypodium giganteum*); **S. rex** Schwartzb. & A.R. Sm., a new species from the Seasonal semi-Deciduous Forest of southeastern Brazil; **S. hirsutulum** (T. Moore) Schwartzb. & A.R. Sm., a species commonly regarded as doubtful; **S. xpubescens** (Rosenst.) Schwartzb. & A.R. Sm., a putative hybrid between *S. menisciifolium* and *S. hirsutulum*; and **S. laetum** (C. Presl) Schwartzb. & A.R. Sm., the correct name for the species recently renamed *S. sehnemii*. In addition, we provide a new conspectus of the genus in Brazil, with a key to the species with fully pinnate laminae.

RESUMO

São apresentadas cinco novidades nomenclaturais em *Serpocaulon*: **S. articulatum** (C. Presl) Schwartzb. & A.R. Sm., o nome correto para os espécimes tradicionalmente chamados *S. giganteum* (ou *Polypodium giganteum*); **S. rex** Schwartzb. & A.R. Sm., uma espécie nova da Floresta Estacional semi-Decídua do sudeste do Brasil; **S. hirsutulum** (T. Moore) Schwartzb. & A.R. Sm., uma espécie comumente tratada como "dubidosa"; **S. xpubescens** (Rosenst.) Schwartzb. & A.R. Sm., um suposto híbrido entre *S. menisciifolium* e *S. hirsutulum*; e **S. laetum** (C. Presl) Schwartzb. & A.R. Sm., o nome correto para a espécie recentemente renomeada *S. sehnemii*. Em adição, é apresentado um novo conspecto do gênero para o Brasil, juntamente com uma chave para as espécies com a lâmina l-pinada.

INTRODUCTION

Serpocaulon A.R. Sm. (Polypodiaceae) is a Neotropical genus comprising ca. 40–45 species with goniophleboid venation (= areoles with one free included veinlet; veins free only in *S. patentissimum* (Mett. ex Kuhn) A.R. Sm., from Colombia, Ecuador; and *S. funckii* (Mett.) A.R. Sm., from Colombia and Venezuela to Bolivia) (Smith et al. 2006; Labiak & Prado 2008). The genus was recently segregated from *Polypodium* L. and *Goniophlebium* (Blume) C. Presl, and had been called the "*Polypodium loriceum* L. complex" (Hensen 1990; Moran 1995). In the Brazilian Atlantic Forest, 10 species are known to occur (Labiak & Prado 2008), although ca. 35 basionyms are referable to them (e.g., Raddi 1825; Fée 1869, 1873; Baker 1870; Hensen 1990).

During a field expedition taken in the Seasonal semi-Deciduous Forest of southeastern Brazil, an understudied sub-formation of the Atlantic Forest, a new species of *Serpocaulon* was found. While comparing it to *S. giganteum* (Desv.) A.R. Sm., we noticed this name needs re-interpretation, and we provide a new combination.

In addition, we propose three new nomenclatural novelties in *Serpocaulon* from the Brazilian Atlantic Forest: the recognition of a species usually regarded as doubtful, the recognition of a putative hybrid, and the correct name for the species recently renamed *S. sehnemii* (Pic. Serm.) Labiak & J. Prado. We also provide a new conspectus of the genus diversity in Brazil, with a key to the species with fully pinnate laminae.

The materials analyzed are marked with an exclamation mark ("!"); an "*" means we saw their images either online (at JStor Plant Science and Swedish Museum of Natural History websites), or sent by herbarium staff (see acknowledgments).

NOMENCLATURAL NOVELTIES

1. *Serpocaulon articulatum* (C. Presl) Schwartzb. & A.R. Sm., comb. nov. BASIONYM: *Goniophlebium articulatum* C. Presl, Tent. Pterid. 186. 1836, nom. nov. for *Polypodium articulatum* Desv., Mém. Soc. Linn. Paris 6:236. 1827, nom. illeg. (non Juss. ex Poir. 1804, nec Vahl 1807). *Polypodium fraxinifolium* Jacq. subsp. *articulatum* (C. Presl) Christ, Bull. Herb. Boissier, sér. 2, 6:49. 1906, as "(Desv.) Christ." TYPE: Anonymous, ex Herb. Desvaux (LECTOTYPE, redesignated here: P*-00624694).

Polypodium fraxinifolium Jacq. subsp. *luridum* Christ, Bull. Herb. Boissier, sér. 2, 6:48. 1906. TYPE: COSTA RICA: Navarro, 1400 m, 1901–1905, C. Wercklé s.n. (BR?-n.v., NY*-frag., P?-n.v., US*-00065826).

This species has commonly been called *Polypodium giganteum* Desv. (Lellinger 1985, 1989; Moran 1995), or *Serpocaulon giganteum* (Desv.) A.R. Sm. (Smith et al. 2006). However, the type of *P. giganteum* (Anonymous, ex Herb. Desvaux [P*-00637550]) corresponds to a species of *Niphidium* J. Sm. (Polypodiaceae), probably *N. crasifolium* (L.) Lellinger, widespread in the Neotropics. We here provide a better name (along with its new combination) for the specimens long named "*Serpocaulon giganteum*" or "*Polypodium giganteum*": *Serpocaulon articulatum*.

The characterization of this species can be found in Lellinger (1989) and Moran (1995), as "*Polypodium giganteum*." Although Smith et al. (2006) cited this species (as *Serpocaulon giganteum*) from southern Brazil, in Brazil it probably occurs only in the northern region, in the Amazon Forest (see Labiak & Prado 2008; Labiak & Hirai 2010).

Lellinger (1985) correctly attributed the combination *Polypodium fraxinifolium* subsp. *articulatum* to Christ (1906), and not a new combination based on Desvaux's illegitimate name. However, he mistakenly designated as lectotype a specimen cited by Christ: *Pittier 9061* (US*-00065825). There is one sheet at P (P*-00624694) that corresponds to Desvaux's original material, and it is appropriate to consider that as the lectotype (ICBN Art. 9.17), redesignated here.

2. *Serpocaulon rex* Schwartsb. & A.R. Sm., sp. nov. (Figs. 1A–H). TYPE: BRAZIL. MINAS GERAIS: Frutal, Reserva Floresta Escola, Floresta Estacional Semi-Decídua, próxima ao Rio Grande, 20°13'58"S, 48°53'03"W, 460 m, 10 Aug 2012, P.B. Schwartsburd 2596 & L.M. Alves (HOLOTYPE: SP!; ISOTYPES: K!, P!, UC!, VIC!).

Differs from all other species of *Serpocaulon* by the larger size of the erect fronds (1.65–1.8 m long). Differs from other southern/southeastern Brazilian species by the sori in 4–6 rows between the costae and the lamina margins (vs. 1–3(–4) rows).

Plants terrestrial. *Rhizomes* long-creeping, stramineous, copiously scaly, 5–10 mm diam.; *scales* lanceolate-acuminate, 0.5–0.75 × 0.2–0.3 mm, peltate basally, clathrate, with margins entire, concolorous. *Fronds* erect, monomorphic, 1.65–1.8 m long; *petioles* brown, glabrous, with two lateral lines of aerophores, 68–77 cm long, 4–6 mm diam.; *laminae* 1-pinnate, linear-acuminate, slightly broader at base, the apex conform, 100–110 × 50–72 cm, lateral pinnae 12–15 pairs; *rachises* glabrous; *proximal and medial pinnae* ascending (sometimes strongly ascending), ca. 45–60° from rachis, linear, often falcate, 25–36 × 2.5–3 cm, with pinna bases inequilateral, cuneate, basiscopically petiolulate, acroscopically sessile, the *margins* cartilaginous, crenate; *costae* nearly glabrous, but abaxially and adaxially with scattered filiform scales 0.4–0.6 mm long and scattered trichomidia 0.1–0.15 mm long, 1–2-celled; *veins* anastomosing in a goniophlebioid pattern, with 5–7 areoles between the costae and the pinna margins, nearly glabrous, but abaxially and adaxially with scattered trichomidia similar to those of the costae; *laminar tissue between the veins* abaxially and adaxially glabrous; *sori* in 4–6 uniseriate rows between main lateral veins running from costae to pinnae margins.

Distribution and ecology.—In the western region of the Brazilian States of Minas Gerais and São Paulo, between the rivers Rio Grande and Tietê. It occurs terrestrially along the margins of streams of Seasonal semi-Deciduous forest. It probably occurs also in the States of Mato Grosso do Sul and Goiás.

Etymology.—The specific epithet is an allusion to the size of the fronds, which are among the largest in *Serpocaulon*.

PARATYPES: **BRAZIL. São Paulo:** Borborema, ca. 21°35'S, 49°07'W, 21 Dec 1996, M.R. Pietrobon-Silva 3917 (SJR); Cosmorama, 02 Dec 1994, A.L. Barbosa & W. Forster 21 (SJR); Nhandeara, ca. 20°43'S, 50°03'W, 18 Jun 1994, F.R. Nonato & M.R. Pietrobon-Silva 24 (SJR); Planalto, ca. 21°02'S, 49°55'W, 15 Aug 1996, M.R. Pietrobon-Silva & F.M. Pedro 3423 (SJR); Presidente Epitácio, 22°05'S, 52°07'W, 250–300 m, 23 Sep 1996, M.R. Pietrobon-Silva & C.T. de Lucca 3476 (SJR); Rosana, região do Pontal do Paranapanema, 22°33'S, 52°44'W, 26 Jul 1997, M.R. Pietrobon-Silva 4086 (SJR); Tanabi, 12 Dec 1990, L.M.S. Viana et al. 1 (SJR); Teodoro Sampaio, Rio Paranapanema, 22°38'S, 52°45'W, 24–26 Feb 1986, P.G. Windisch 4720 (SJR).

Among the pinnate species of *Serpocaulon* from southern/southeastern Brazil, *S. rex* differs from *S. triseriale* (Sw.) A.R. Sm. by stramineous *rhizomes* (vs. dark brown), concolorous *rhizome scales* with the margins entire and clathrate (vs. scales bicolorous with margins subentire and hyaline), *fronds* 1.65–1.8 m long (vs. 0.5–1.2 m

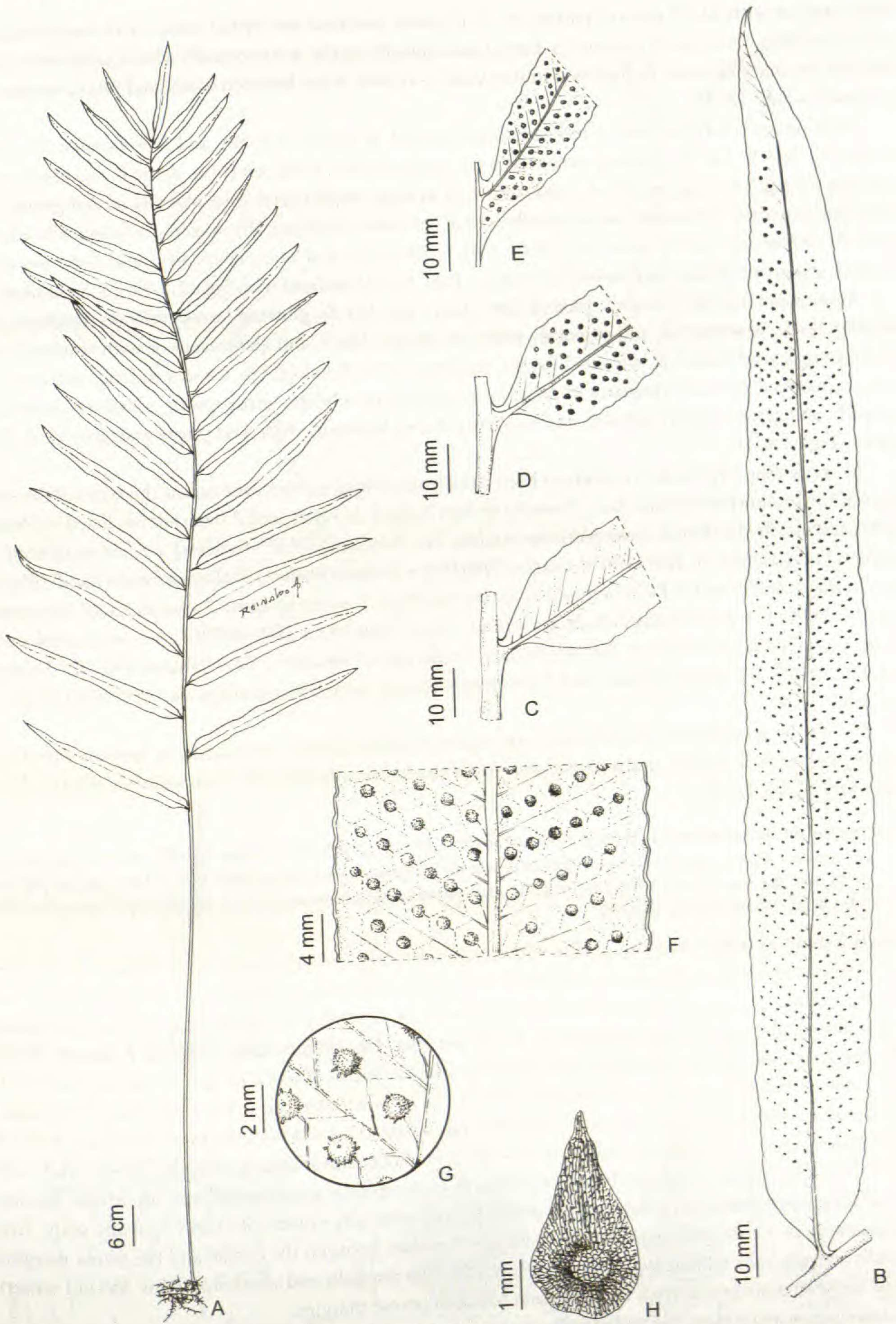


FIG. 1. *Serpocaulon rex* (Schwartzburd 2596): A. habit; B. medial pinna; C. base of proximal pinna; D. base of medial pinna; E. base of distal pinna; F., G. details of a medial pinna, abaxially; H. rhizome scale.

long), *laminae* with 12–15 pairs of pinnae (vs. 5–10 pairs), *proximal and medial pinnae* with bases basiscopically petiolulate, acroscopically sessile (vs. bases basiscopically sessile, acroscopically adnate), and with crenate margins (vs. margins entire to slightly undulate), and 4–6 rows of *sori* between costae and pinna margins (vs. 1–3 rows)—Figs. 1A–H.

Serpocaulon rex differs from *S. menisciifolium* (Langsd. & Fisch.) A.R. Sm. and *S. hirsutulium* (T. Moore) Schwartsb. & A.R. Sm. by growing terrestrially (vs. epiphytically), *fronds* erect (vs. arched) and much larger, reaching 1.65–1.8 m long (vs. 0.5–1.4 and 0.45–0.55 m long, respectively), *proximal and medial pinnae* with bases basiscopically petiolulate, acroscopically sessile (vs. bases basiscopically sessile, acroscopically adnate), glabrous *rachises* (vs. *rachises* pilose or villous, with septate hairs and lanceolate scales), and 4–6 rows of *sori* between costae and pinna margins (vs. 1–3 rows)—Figs. 1A–H (confront with Figs. 2A–H of *S. hirsutulium*).

Serpocaulon rex differs from *S. fraxinifolium* (Jacq.) A.R. Sm. by growing terrestrially (vs. epiphytically), *rhizomes* thick, stramineous, and copiously scaly (vs. slender, black, and glabrescent or with scattered, non-overlapping, round scales), *fronds* much larger, reaching 1.65–1.8 m long (vs. 0.4–0.9 m long) and erect (vs. arched), *proximal and medial pinnae* with bases basiscopically petiolulate, acroscopically sessile (vs. bases basiscopically and acroscopically sessile), and 4–6 rows of *sori* between costae and pinna margins (vs. 1–3(–4) rows)—Figs. 1A–H.

To verify that *Serpocaulon rex* had not been already described, we observed online the types of the synonyms of *Polypodium fraxinifolium* Jacq., *P. menisciifolium* Langsd. & Fisch., and *P. triseriale* Sw. listed by Hensen (1990) and ascribed to Brazil: *Goniophlebium excelsior* Fée (Glaziou 3334 [P*-6 sheets]; = *S. menisciifolium*), *G. gauthieri* Fée (Gauthier s.n. [RB*-31818], Glaziou 2406 [P*]; = *S. menisciifolium*), *P. albopunctatum* Raddi (illustrations in Raddi 1825!; and in Pichi Sermolli & Bizzarri 2005!; = *S. menisciifolium*), *P. distans* Raddi (illustration in Raddi 1825!; = *S. fraxinifolium*), *P. elatius* Schrad. (Wied-Neuwied s.n. [BR*-697061]; = *S. menisciifolium*), *P. lucens* Schrad. (Wied-Neuwied s.n. [BR*-697025]; = *S. triseriale*), *P. mosenii* C. Chr. (Glaziou 4422 [P*-3 sheets], Mosén 2208 [P*]; = *S. menisciifolium*), and *P. preslianum* Spreng. (type?: Brackenridge s.n. [PH*-00021063]; = *S. triseriale*).

Besides the geographical distribution, *Serpocaulon rex* differs from *S. articulatum* by *laminae* with 12–15 pairs of pinnae (vs. 2–7 pairs), and *proximal and medial pinnae* linear-falcate, 2.5–3 cm wide (vs. elliptic, (3–)4–6 cm wide)—Figs. 1A, B.

3. *Serpocaulon hirsutulium* (T. Moore) Schwartsb. & A.R. Sm., comb. nov. (Figs. 2A–H). BASIONYM: *Goniophlebium hirsutulium* T. Moore, Index Fil. (T. Moore) 390. 1862, nom. nov. for *Polypodium hirsutulium* Raddi, Pl. Bras. Nov. Gen. 21, t. 29, fig. 2. 1825, nom. illeg. (non G. Forst. 1786). TYPE: [BRAZIL]: super palmarum annosarum truncos in viciniis urbis Rio-Janeiro, [Nov 1817–May 1818], G. Raddi s.n. (HOLOTYPE: PI*).

Plants epiphytic. *Rhizomes* creeping, chalky-white, copiously scaly, 5–6 mm diam.; *scales* deltate, 1.5–3 × 1.5–2 mm, or deltate and long-acuminate (in plantlets), 4–5 × 1–1.2 mm, peltate basally, clathrate, bicolorous, with margins hyaline, crenate to slightly erose. *Fronds* arched, monomorphic, 45–55 cm long; *petioles* stramineous to light brown, glabrate, without aerophores, 15–20 cm long, 1.8–2.8 mm diam.; *laminae* 1-pinnate, linear-ovate, the apex conform, the distalmost pair of pinnae much reduced, 30–35 × 18–20 cm, lateral pinnae 9–13 pairs; *rachises* abaxially and adaxially densely villous, the *hairs* whitish, lax, 0.5–1.2 mm long, 5–12-celled, abaxially also with sparse scales, the *scales* clathrate, lanceolate, 0.7–1 × 0.5–1 mm; *proximal pinnae* deflexed, *medial pinnae* patent to slightly ascending, ca. 70–90° from rachis, linear-oblong with the *apices* round to obtuse, 9–10 × 1.5–2.2 cm, with pinna bases inequilateral, basiscopically sessile, acroscopically adnate, the *margins* cartilaginous, undulate, villous; *costae* abaxially and adaxially villous, abaxially sparsely scaly; *veins* anastomosing in a goniophlebioid pattern, with 3(–4) areoles between the costae and the pinna margins, abaxially and adaxially villous; *laminar tissue* between the veins abaxially and adaxially villous; *sori* in 1 uniseriate row between main lateral veins running from costae to pinnae margins.

Distribution and ecology.—Epiphytically on the Coastal to Montane Forests of the Brazilian Atlantic Forest, in the States of Rio de Janeiro, Minas Gerais, and São Paulo. Probably, it also occurs in the States of Espírito Santo and Paraná.

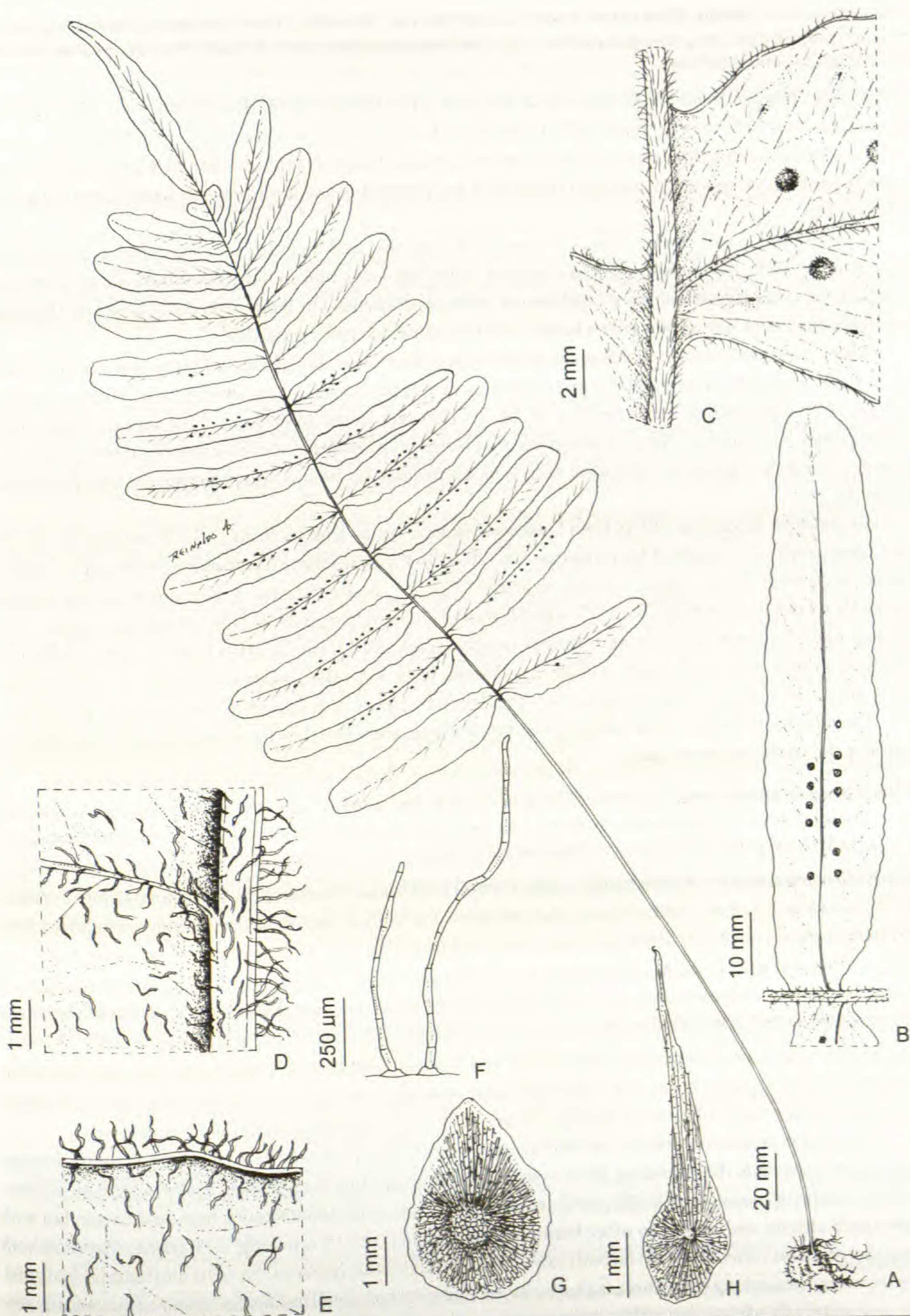


FIG. 2. *Serpocaulon hirsutum*: A. habit; B. medial pinna; C. base of medial pinna; D., E. details of a medial pinna, abaxially; F. hairs of rachis; G. rhizome scale from adult plant; H. rhizome scale from plantlet. A-C, G, H (Brade 8246); D-F (Schwartzburd 2649).

Additional specimens: **BRAZIL. Minas Gerais:** Tiradentes, Centro Histórico, 16 Nov 2012, P.B. Schwartsburd et al. 2641 (VIC!); id., Serra de São José, 18 Nov 2012, P.B. Schwartsburd et al. 2649 (UC!, VIC!). **São Paulo:** Mun. Iguape, Morro das Pedras, May 1922, A.C. Brade 8246 (HB!, UC!); id., s.d., A.C. Brade 59976 (HB!).

This species has commonly been regarded as doubtful. After Raddi's (1825) description, Fée (1869, 1873) regarded it as "not well known"; Brade (1951) considered it, with doubts, as a juvenile form of *Polypodium menisciifolium*; and Hensen (1990) synonymized it under *P. menisciifolium*. Pichi Sermolli and Bizzarri (2005) found a solely sterile type-specimen, and also regarded it as synonym of *Goniophlebium menisciifolium* (Langsd. & Fisch.) J. Sm.

On the other hand, Moore (1862) recognized it a species, and included it in the genus *Goniophlebium*. Rosenstock (1925) also recognized it as a species, citing one collection we have examined (Brade 8246), and compared it to his *Polypodium menisciifolium* var. *pubescens* Rosenst. On Brade 8246 (UC), he wrote "*Polypodium raddianum*, nom. nov., *P. hirsutulum* Raddi," but this name was never published.

There is also an enigma regarding the proper type collection of this species at PI, the only material found by Pichi-Sermolli and Bizzarri (2005) and consisting of a sterile frond, lacking the rhizome. Without doubt, it was the plant illustrated in Raddi (1825: t. 29, fig. 2!). However, in the description of the species, Raddi (1825: 21) indicated "*soris sparsis*." Thus, it is possible that further type material will be found in other herbaria. *Serpocaulon hirsutulum* appears to hybridize with *S. menisciifolium* (see below), thus blurring the interpretation of these taxa.

Serpocaulon hirsutulum differs from *S. menisciifolium* s. str. by smaller fronds, 45–55 cm long (vs. 50–140 cm), laminae with 9–13 pairs of lateral pinnae (vs. (20–)25–35 pairs), pinnae linear-oblong with apices round to obtuse (vs. pinnae falcate, apices cuneate to acute) (Figs. 2A, B). In addition, *S. hirsutulum* has the laminae markedly villous, with whitish lax 5–12-celled hairs, 0.5–1.2 mm long, on both sides of rachises, costae, veins, laminar tissue between the veins, and laminar margins (Figs. 2C–F). On the other hand, *S. menisciifolium* has stiff hyaline hairs with cross-walls reddish, 0.2–0.4 mm long, 3–5-celled, mainly restricted to rachises (especially adaxially), and scattered on costae; the other laminar regions of *S. menisciifolium* are totally glabrous.

The putative hybrids exhibit intermediate morphology, and since they have been formally described, we combine the epithet in *Serpocaulon*.

4. *Serpocaulon* × *pubescens* (Rosenst.) Schwartsb. & A.R. Sm., comb. et stat. nov. BASIONYM: *Polypodium menisciifolium* Langsd. & Fisch. var. *pubescens* Rosenst., Repert. Spec. Nov. Regni Veg. 21:348. 1925. TYPE: BRAZIL. SÃO PAULO: Morro Jaraguá, 08 Dec 1912, A.C. Brade 5384 (LECTOTYPE, designated here: HB!-39800).

Distribution and ecology.—Epiphytically on the Coastal to Montane Forests of the Brazilian Atlantic Forest, in the States of Rio de Janeiro, Minas Gerais, and São Paulo. Probably, it also occurs in the States of Espírito Santo and Paraná. Rosenstock (1925) listed it also to Rio Grande do Sul.

Additional specimens: **BRAZIL. Rio de Janeiro:** Região de Nova Friburgo, ca. 22°10'S, 42°40'W, 1070 m, 10 Feb 1987, P.G. Windisch et al. 4978 (HB!). **Minas Gerais:** Tiradentes, Serra de São José, 18 Nov 2012, P.B. Schwartsburd et al. 2650 (UC!, VIC!). **São Paulo:** Pilar [Pilar do Sul?], 04 Mar 1902, Gerdes 50 (S*-059227).

Serpocaulon × *pubescens* is a putative hybrid between *S. menisciifolium* and *S. hirsutulum*, possibly occurring everywhere both species are present. Although many sporangia and spores are malformed, there are indeed some well-formed ones. Whether or not this putative hybrid can reproduce on its own is unknown.

Serpocaulon × *pubescens* presents an intermediate morphology between the two parents: it has the laminar architecture (especially the ascending, falcate pinnae, with cuneate to acute apices) of *S. menisciifolium*; an intermediate number of pinnae (9–20(–25) pairs); indument similar to *S. hirsutulum* on rachises and costae, but with hairs much shorter and sparse on other laminar regions (hairs 0.2–0.4 mm long, 2–4-celled, sparse on both sides of costae and veins, scattered on both sides of the laminar tissue between the veins and laminar margins). Common features among these three taxa are: the attachment of proximal and medial pinnae (basiscopically sessile, acroscopically adnate), lanceolate scales present on costae abaxially, and calcareous dots on the hydathodes adaxially, an unusual character in the genus.

5. *Serpocaulon laetum* (C. Presl) Schwartzb. & A.R. Sm., comb. nov. BASIONYM: *Marginaria laeta* C. Presl, Tent. Pterid. 188. 1836, *nom. nov.* for *Polypodium laetum* Raddi, Opusc. Sci. Bol. 3:287. 1819, *nom. illeg.* (non Salisb. 1796). *Goniophlebium laetum* (C. Presl) J. Sm. in Seemann, Bot. Voy. Herald 6:231. 1854 [1855?], as "(Raddi) J. Sm." *Polypodium loriceum* L. var. *laetum* (C. Presl) Baker in Martius & Eichler, Fl. Bras. (Martius) 1(2):523. 1870. *Goniophlebium sehnemii* Pic. Serm., in Pichi Sermolli & Bizzarri, Webbia 60(1):108. 2005, *nom. superfl.* *Serpocaulon sehnemii* (Pic. Serm.) Labiak & J. Prado, Amer. Fern J. 98(3):153. 2008. TYPE: BRASÍLIA: [in nemoribus aliquantum udis aliorum montium estrellensium], [Nov 1817–May 1818], G. Raddi s.n. (LECTOTYPE, designated by Pichi Sermolli & Bizzarri 2005: 108: PI* [spec. 2]; ISOLECTOTYPES: BR*-697793; P*-00633216, P*-00637554; PI-n.v. [spec. 1]).

We consider Presl's (1836) *Marginaria laeta* to be a *nomen novum* for the illegitimate *Polypodium laetum* Raddi and, therefore, the earliest basionym available in *Serpocaulon* for this species (ICBN Art. 58.1, Ex. 1). Characterization of this species can be found in Sehnem (1970), Pichi Sermolli and Bizzarri (2005), Labiak and Prado (2008), and Prado et al. (2010), respectively, as *Polypodium laetum*, *Goniophlebium sehnemii*, *Serpocaulon sehnemii*, and *S. sehnemii*.

THE DIVERSITY OF SERPOCAULON IN BRAZIL

Adding the above novelties to recent information (Hensen 1990; Smith et al. 2006; Labiak & Prado 2008; Assis & Labiak 2009; Labiak & Hirai 2010), the Brazilian Atlantic Forest (southern/southeastern Brazil, plus southern Bahia) contains 12 known species of *Serpocaulon*, plus a putative hybrid between two of them. This is ca. 25% of the diversity in the genus. Two species are widespread throughout the Neotropics (*S. fraxinifolium* and *S. triseriale*), one has a disjunct distribution in southeastern/northeastern Brazil, Costa Rica, Panama, Andes, Guadeloupe, Venezuela, and the Guianas (*S. levigatum* (Cav.) A.R. Sm.), two occur in the Atlantic Forest and south-westward to central Brazil, Paraguay, Uruguay, and northern Argentina (*S. catharinae* (Langsd. & Fisch.) A.R. Sm. and *S. vacillans* (Link) A.R. Sm.), four and the hybrid are endemic to the Atlantic Forest s.l. (*S. hirsutulium*, *S. laetum*, *S. latipes* (Raddi) A.R. Sm., *S. menisciifolium*, and *S. xpubescens*), and three are narrow endemics to sub-formations of the Atlantic Forest (*S. glandulosissimum* (Brade) Labiak & J. Prado and *S. mexiae* (Copel.) A.R. Sm. from the highland elfin forests; and *S. rex* from the Seasonal semi-Deciduous Forest). Due to the percentage of the species richness (ca. 25%) and the number of endemics (7 spp. and a hybrid), we affirm the Brazilian Atlantic Forest is a main center of diversity in *Serpocaulon*.

In the Brazilian Amazon (central to northern Brazil) another five or six species occur: *Serpocaulon articulatum*, *S. caceresii* (Sodiolo) A.R. Sm. (also in the state of Ceará), *S. panorense* (C. Chr.) A.R. Sm., *S. richardii* (Klotzsch) A.R. Sm., *S. sessilifolium* (Desv.) A.R. Sm., and very probably *S. attenuatum* (Willd.) A.R. Sm. *Serpocaulon fraxinifolium* and *S. triseriale* also occur there (fide Smith et al. 2006; Zuquim et al. 2008; Labiak & Hirai 2010; Carvalho et al. 2012). Brazilian plants ascribed to *S. adnatum* (Klotzsch) A.R. Sm. are better referred to *S. richardii*; *S. adnatum* occurs in western Venezuela, Colombia, and Ecuador.

In total, 17 or 18 species and a hybrid of *Serpocaulon* are known from Brazil, and this is more than a third of the total in the genus. Because of taxonomic uncertainties in the genus and the lack of exploration in certain areas in Brazil, it is likely that there are additional undescribed taxa. A new monographic revision is required to reveal whether some basionyms currently judged as synonyms should be reconsidered as species, especially within the *S. catharinae-latipes* complex.

KEY TO THE BRAZILIAN SPECIES OF SERPOCAULON WITH FULLY PINNATE LAMINAE (WITH DISTRIBUTION DATA WITHIN BRAZIL)

1. Medial pinnae acroscopically (at least) adnate to the rachis (e.g., Fig. 2C). _____ **S. triseriale**
2. Rachises glabrous; hydathodes adaxially without secretions; widespread _____
2. Rachises pilose to villous, especially adaxially, with septate hairs and lanceolate scales; hydathodes adaxially commonly with calcareous secretions. _____
3. Lateral pinnae (20–)25–35 pairs; veins, laminar tissue between the veins, and laminar margins totally glabrous; Atlantic Forest _____ **S. menisciifolium**
3. Lateral pinnae 9–20(–25) pairs; veins, laminar tissue between the veins, and laminar margins with septate hairs. _____
4. Pinnae apices round to obtuse; veins, laminar tissue between the veins, and laminar margins copiously villous, the hairs 0.5–1.2 mm long, 5–12-celled; Atlantic Forest _____ **S. hirsutulium**
4. Pinnae apices cuneate to acute; veins, laminar tissue between the veins, and laminar margins sparsely pilose, the hairs 0.2–0.4 mm long, 2–4-celled; Atlantic Forest _____ **S. xpubescens**

1. Medial pinnae acroscopically sessile (e.g., Fig. 1D).
5. Costae abaxially pilose, with whitish, septate hairs; Amazon basin _____ **S. richardii**
5. Costae abaxially nearly glabrous, but with scattered trichomidia, linear scales, and/or ovate scales.
6. Fronds 1.65–1.8 m long; medial pinnae inequilateral, basiscopically petiolulate, acroscopically sessile; plants terrestrial; Atlantic Forest (Seasonal semi-Deciduous Forest) _____ **S. rex**
6. Fronds 0.4–1.2 m long; medial pinnae basiscopically sessile, ± equilateral at bases; plants usually epiphytic, occasionally terrestrial.
7. Rhizome scales spreading, dense, strongly clathrate, iridescent; plants terrestrial or epiphytic; Amazon basin and Ceará _____ **S. caceresii**
7. Rhizome scales appressed, sparse, or barely covering the rhizomes, moderately to weakly clathrate, appearing blackish, not iridescent; plants epiphytic.
8. Sori in 4–8(–10) rows on each side of costae; pinnae (3–)4–6 cm wide; Amazon basin _____ **S. articulatum**
8. Sori in 1–3(–4) rows on each side of costae; pinnae 1–2.5(–3.5) cm wide.
9. Sori in 1–3(–4) rows on each side of costae; pinnae 1–2.5(–3.5) cm wide; widespread _____ **S. fraxinifolium**
9. Sori in 1 row on each side of costae; pinnae 0.7–1.3 cm wide; Amazon highlands (Tepuis) _____ **S. sessilifolium**

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